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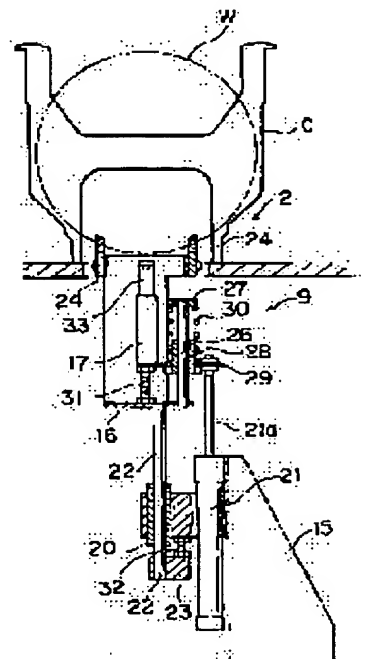
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(54) NUMBER OF SUBSTRATES DETECTING DEVICE

(57)Abstract:

PURPOSE: To detect the number of substrates without deeply inserting a guide member into the substrates.

CONSTITUTION: A substrate quantity detecting means 9 is a device to detect the number of multiple substrates W arranged in such orders that their main faces are opposed to each other. Also it is provided with a substrate guide 24, a substrate detecting part 33, a lifting frame 16, a base frame 15, an air cylinder 21 to liftably drive the substrate detecting part 33, a spring 30 to elastically connect the substrate detecting part 33 to the lifting frame 16, and a stopper 32 to stop the lifting frame 16 during the lifting. Then the substrate guide 24 stops the movement of the substrate W. The substrate detecting part 33 detects the existence of the arranged substrate W. The lifting frame 16 supports the substrate detecting part 33 liftably, and holds the substrate guide 24 at a position higher than that of the substrate guide 24. A base frame 15 supports the lifting frame 16 liftably.



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CLAIMS

[Claim(s)]

[Claim 1] Substrate number-of-sheets detection equipment equipped with the rise-and-fall means turns the guide means which is equipment which detects the number of sheets of the substrate of a large number which aligned after a principal plane had countered, contacts the periphery section of said substrate which aligned and carries out the bracing of the substrate, a substrate detection means detect said existence of a substrate which aligned, and said guide means and said substrate detection means to said substrate, and you make it a means go up and down according to an individual.

[Claim 2] Said guide means is substrate number-of-sheets detection equipment according to claim 1 which separates spacing in alignment with said principal plane, and is formed one pair.

[Claim 3] Said substrate detection means is substrate number-of-sheets detection equipment according to claim 1 or 2 which is the same spacing as alignment spacing of said substrate, and has many slots of a bigger flute width than the thickness of said substrate, and the detection section which detects whether said substrate entered said slot.

[Claim 4] Said detection section is substrate number-of-sheets detection equipment according to claim 3 which is the photosensor which has the floodlighting section and the light sensing portion by which opposite arrangement was carried out into said slot.

[Claim 5] Said rise-and-fall means is substrate number-of-sheets detection equipment given in either of claims 1-4 which makes it go up and down only said substrate detection means when you make it go up and down both said guide means and a substrate detection means and said guide means arrives at a substrate bracing location until said guide means arrives at a substrate bracing location.

[Claim 6] The 1st supporter which supports said rise-and-fall means for said substrate detection means, enabling free rise and fall, and holds said guide means from said substrate detection means in the upper part, The rise-and-fall actuator which does rise-and-fall actuation of said substrate detection means, and the 2nd supporter supported for said 1st supporter, enabling free rise and fall, Substrate number-of-sheets detection equipment [equipped with a connection means to connect elastically said substrate detection means and said 1st supporter, and a regulation means to be in the middle of lifting and to stop said 1st supporter] according to claim 5.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to substrate number-of-sheets detection equipment and the substrate number-of-sheets detection equipment which detects the number of sheets of the substrate of a large number which aligned after the principal plane had countered especially.

[0002]

[Description of the Prior Art] For example, there is a wafer counter indicated by JP,64-743,A as substrate number-of-sheets detection equipment. This wafer counter is equipped with the rise-and-fall actuator which makes it go up and down the sensing element pair which consists of the floodlighting component and photo detector which were prepared for Mizouchi so that an optical path might be intercepted when a wafer (an example of a substrate) fits into the wafer guide (an example of a guide means) which has the slot of a large number arranged at the same spacing as receipt spacing of a carrier, and a wafer guide, and a wafer guide and a sensing element pair. A wafer guide is for carrying out the bracing of the wafer in a carrier so that a wafer can be detected by the sensing element pair.

[0003] In this wafer counter, a wafer guide and a sensing element pair are raised by the rise-and-fall actuator with one. And first, a wafer is held from the lower part of a carrier in the slot of a wafer guide, and the bracing of a wafer is performed. And the existence of the wafer for every wafer guide is detected by the sensing element pair, and wafer number of sheets is detected.

[0004]

[Problem(s) to be Solved by the Invention] Since the orientation flat is generally formed, this kind of wafer needs to insert a sensing element pair in a wafer deeply. In order to insert a sensing element pair in a wafer deeply, with said conventional configuration, a wafer guide must be further inserted to the back. A wafer guide is because a bracing must be contacted and carried out to a wafer at the sensing element pair-twinning point. consequently, a wafer is deep, a wafer guide comes out, a wafer is contacted, a wafer is damaged or particle is generated. Usually, it is from an edge to about 2-3mm that contact is permitted with the wafer, and with said conventional configuration, a wafer guide enters between wafers to the back, so that it does not approve.

[0005] The object of this invention is to offer the substrate number-of-sheets detection equipment which can detect substrate number of sheets, without inserting a guide means in a substrate deeply.

[0006]

[Means for Solving the Problem] The substrate number-of-sheets detection equipment concerning claim 1 is equipment which detects the number of sheets of the substrate of a large number which aligned after the principal plane had countered, and is equipped with the guide means, the substrate detection means, and the rise-and-fall means. A guide means contacts the periphery section of the substrate which aligned, and carries out the bracing of the substrate. A substrate detection means is for detecting the existence of the substrate which aligned. A rise-and-fall means turns a guide means and a substrate detection means to a substrate, and is made

to go up and down them according to an individual.

[0007] In equipment according to claim 1, a guide means separates spacing along with a principal plane, and the substrate number-of-sheets detection equipment concerning claim 2 is formed one pair. In equipment according to claim 1 or 2, a substrate detection means is the same spacing as alignment spacing of a substrate, and the substrate number-of-sheets detection equipment concerning claim 3 has many slots of a bigger flute width than the thickness of a substrate, and the detection section which detects whether the substrate entered the slot.

[0008] The substrate number-of-sheets detection equipment concerning claim 4 is a photosensor with which the detection section has into a slot the floodlighting section and the light sensing portion by which opposite arrangement was carried out in equipment according to claim 3. The substrate number-of-sheets detection equipment concerning claim 5 makes it go up and down only a substrate detection means in equipment given in either of claims 1-4, when a rise-and-fall means makes it go up and down both a guide means and a substrate detection means until a guide means arrives at a substrate bracing location, and a guide means arrives at a substrate bracing location.

[0009] The substrate number-of-sheets detection equipment concerning claim 6 is set to equipment according to claim 5. The 1st supporter with which a rise-and-fall means supports a substrate detection means, enabling free rise and fall, and holds a guide means from a substrate detection means in the upper part. It has a connection means to connect elastically the rise-and-fall actuator which does rise-and-fall actuation of the substrate detection means, the 2nd supporter supported for the 1st supporter, enabling free rise and fall, and a substrate detection means and the 1st supporter, and a regulation means to be in the middle of lifting and to stop the 1st supporter.

[0010]

[Function] With substrate number-of-sheets detection equipment according to claim 1, the periphery section of the substrate which the guide means went up and down with the rise-and-fall means, and aligned is contacted, and the bracing of the substrate is carried out. Then, a substrate detection means goes up and down with a rise-and-fall means, and the existence of the substrate which aligned is detected. With substrate number-of-sheets detection equipment according to claim 2, even if notches, such as an orientation flat, are formed in the substrate, one side of the guide means established one pair contacts the periphery section of a substrate, and carries out the bracing of the substrate.

[0011] It enters into the substrate by which the bracing was carried out with the guide means with the substrate number-of-sheets detection equipment concerning claim 3, without the slot of a substrate detection means contacting a substrate. And it detects whether the substrate entered into the detection section fang furrow section. With substrate number-of-sheets detection equipment according to claim 4, light is irradiated towards a light sensing portion from the floodlighting section arranged in the slot. And when the substrate has entered the slot, an optical path is intercepted, and the existence of a substrate is detected.

[0012] A guide means and a substrate detection means are made to go up and down with both rise-and-fall means with substrate number-of-sheets detection equipment according to claim 5 until a guide means arrives at a substrate bracing location. And when a guide means arrives at a substrate bracing location, only a substrate detection means is made to go up and down. With the substrate number-of-sheets detection equipment concerning claim 6, if a substrate detection means is raised in a rise-and-fall actuator, the 1st supporter connected elastically will interlock and go up with a connection means. And it is in the middle of lifting, and the 1st supporter suspends lifting with a regulation means. At the time of this halt, the guide means held at the 1st supporter carries out the bracing of the substrate. Then, lifting actuation only of the substrate detection means is done by the rise-and-fall actuator, it enters into a substrate deep in non-contact, and the existence of a substrate is detected.

[0013]

[Example] In drawing 1, the dipping former substrate processor 1 with which one example of this invention was adopted is equipped with the carrying-in taking-out section 2, the substrate transfer equipment 3, the substrate processing tub 4, the dryer 5, and the substrate carrier robot

6 for carrying in and taking out the carrier C for containing Substrate W. Moreover, the substrate processor 1 has two or more drug solution storage containers 7a-7e. The drug solution in each container 7a-7e is supplied to the substrate processing tub 4 according to a predetermined program.

[0014] The substrate number-of-sheets detection equipment 9 which detects the number of sheets of the substrate in the carried-in carrier C, and the carrier transfer robot 10 which takes out Carrier C are formed in the carrying-in taking-out section 2. Rise and fall and a revolution are possible for the carrier transfer robot 10, and he is movable in the direction (the equipment depth direction) shown in the arrow head A of drawing 1. The substrate transfer equipment 3, the substrate processing tub 4, and the dryer 5 are installed in the longitudinal direction side by side. The substrate carrier robot 6 has one pair of arms 11 for grasping a substrate. Moreover, the substrate carrier robot 6 is movable in the direction (equipment longitudinal direction) shown by the arrow head B, and can go up and down in it. With this substrate carrier robot 6, a substrate can be conveyed between dryers 5 from the substrate transfer equipment 3. Moreover, the substrate holder 12 in which the rise and fall for a substrate being immersed within a processing tub are possible is formed in the substrate processing tub 4.

[0015] Substrate number-of-sheets detection equipment 9 has the base frame 15 prepared in the carrying-in taking-out section 2 of the substrate processor 1, the rise-and-fall frame 16 supported by the base frame 15 free [rise and fall], and the detection frame 17 supported by the rise-and-fall frame 16 free [rise and fall], as shown in drawing 2 and drawing 3. The slide bearing 20 for supporting the rise-and-fall frame 16 and the air cylinder 21 for carrying out rise-and-fall actuation of the detection frame 17 are formed in the base frame 15. The slide bearing 20 separates spacing in the depth direction (longitudinal direction of drawing 2) of equipment, and is prepared in it one pair. The air cylinder 21 is formed so that piston shaft 21a can be marched out up. One pair of guide shafts 22 caudad prolonged from the underside of the rise-and-fall frame 16 have fitted into the slide bearing 20. The soffit of one pair of these guide shafts 22 is connected by the connector member 23.

[0016] Spacing is separated to the longitudinal direction (longitudinal direction of drawing 3) of equipment, and one pair of substrate guides 24 are formed in the upper part of the rise-and-fall frame 16. As shown in drawing 4 and drawing 5, the ctenidium-like retention groove 25 is formed in the upper bed of the substrate guide 24. Guide inclined plane 25a cut and lacked in V characters is formed in the upper bed section of this retention groove 25. The edge (periphery section) of the periphery of Substrate W is held by this retention groove 25.

[0017] As shown in drawing 2 and drawing 3, the guide shaft 26 prolonged up is also formed in the rise-and-fall frame 16. The guide shaft 26 separates spacing in the depth direction (longitudinal direction of drawing 2) of equipment, and is prepared in it one pair. The guide shaft 26 is connected by the upper bed, and is connected by the member 27. The slide bearing 28 is inserted in the guide shaft 26. The slide bearing 28 is formed in the middle of the connecting fitting 29 which connects the detection frame 17 and piston shaft 21a of an air cylinder 21. Between the connector member 27 and connecting fitting 29, the spring 30 is arranged in the state of compression around the guide shaft 26. The spring 30 energized the rise-and-fall frame 16 up to the detection frame 17, and has connected elastically the rise-and-fall frame 16 and the detection frame 17. Moreover, the stopper 32 for the stopper 31 for preventing descent of the detection frame 17 to make the base frame 15 suspending lifting of the rise-and-fall frame 16 on the way is formed in the rise-and-fall frame 16, respectively.

[0018] The sheet metal-like substrate detecting element 33 is set up by the upper bed of the detection frame 17. Between the substrate detecting elements 33, the substrate detecting element 33 is arranged at equal intervals so that slot 33a may be formed and the width of face (clearance between the substrate detecting elements 33) of slot 33a may become larger than the thickness of Substrate W, as shown in drawing 4 and drawing 5. In addition, the head of the substrate detecting element 33 is arranged in the location lower than the head of the substrate guide 24.

[0019] The photosensor 34 of the transparency mold for detecting the existence of the substrate W in which the bracing was carried out to the adjacent substrate detecting element 33

by the retention groove 25 of the substrate guide 24 is arranged. Opposite arrangement of the 1 to floodlighting section 34T and light sensing portion 34R is carried out, and each photosensor 34 is constituted. Light sensing portion 34R of another photosensor 34 which adjoins floodlighting section 34T and it of one photosensor 34 is arranged at one substrate detecting element 33, consequently the photosensor 34 is arranged alternately. In addition, the point of floodlighting section 34T and light sensing portion 34R is constituted by the optical fiber of for example, a side view mold.

[0020] Next, actuation of an above-mentioned example is explained. If a substrate is laid in the carrying-in taking-out section 2, the number of sheets of the substrate W with which substrate number-of-sheets detection equipment 9 was contained in Carrier C will be detected. At the time of this number-of-sheets detection, piston shaft 21a of an air cylinder 21 is made to march out up first, as shown in drawing 6, and the detection frame 17 is raised. Lifting of the detection frame 17 also interlocks and raises the rise-and-fall frame 16 energized with the spring 30. And if the connector member 23 contacts a stopper 32, the rise-and-fall frame 16 will be in the middle of lifting, and will stop. At this time, the substrate guide 24 lifts slightly the substrate W contained in Carrier C, holds the periphery section by the retention groove 25, and carries out the bracing of the substrate W.

[0021] It is in the condition which the rise-and-fall frame 16 stopped, and if piston shaft 21a of an air cylinder 21 is made to march out further, as shown in drawing 7, a spring 30 will bend gradually, and only the detection frame 17 will go up. And the photosensor 34 of the detection frame 17 enters into the substrate W contained in Carrier C deep, and is shaded by Substrate W. Substrate number of sheets is detectable with the number of these shaded sensors.

[0022] Detection of substrate number of sheets carries out ** ON of the piston shaft 21a of an air cylinder 21. Then, a spring 30 develops, and only the detection frame 17 descends until the substrate detecting element 33 separates from Substrate W, until the detection frame 17 contacts a stopper 31. And if the detection frame 17 contacts a stopper 31, the rise-and-fall frame 16 will also descend with the detection frame 17, and the bracing of Substrate W will be canceled.

[0023] Here, since the substrate detecting element 33 enters into Substrate W deep further after the substrate guide 24 carries out the bracing of the substrate and stops, Substrate W and the substrate detecting element 33 cannot contact easily. Consequently, Substrate W cannot get damaged easily. Moreover, since the substrate guide 24 holds the periphery section of Substrate W by the retention groove 25, Substrate W cannot get damaged more easily. Moreover, since the substrate guide 24 is positioning Carrier C for the bracing of a substrate as the line coarsely, substrate number of sheets is certainly detectable. Furthermore, since one pair of substrate guide 24 is formed, even if it is the substrate W which has an orientation flat side, one of the substrate guides 24 performs a bracing certainly, and substrate number of sheets can be detected to accuracy.

[0024] After substrate number-of-sheets detection processing is completed, the carrier transfer robot 10 conveys two carrier [one] C at a time in the substrate transfer section 3. In the carrier transfer section 3, take out Substrate W from the inside of Carrier C of two pieces collectively, it is made to align at equal intervals, and the substrate carrier robot 6 which is standing by up is passed. The substrate carrier robot 6 hands the received substrate W for two carriers C to the substrate holder 12 of the substrate processing tub 4. The substrate holder 12 makes the received substrate W immersed in the substrate processing tub 4. In the substrate processing tub 4, various drug solution processings are performed to the immersed substrate W. The substrate W by which drug solution processing was carried out is passed to the substrate carrier robot 6 from the substrate holder 12, is sent to a dryer 5, and desiccation processing is performed. After desiccation processing is completed, Substrate W is conveyed by the substrate transfer section 3 with the substrate carrier robot 6, and it is inserted into two carriers C. And two carriers C are transferred to the carrying-in taking-out section 2 by the carrier transfer robot 10, and substrate number-of-sheets detection processing by substrate number-of-sheets detection equipment 9 is performed again. Termination of substrate number-of-sheets detection processing takes out Carrier C from the carrying-in taking-out section 2.

[0025] [Other Example(s)]

- (a) You may make it go up and down the substrate guide 24 and the substrate detecting element 33 according to an individual by another drive system.
- (b) A lifting halt of the substrate guide 24 may not be carried out by the stopper 32, and a lifting halt may be carried out by the self-weight of Substrate W.
- (c) The rise-and-fall frame 16 and the detection frame 17 may not be elastically connected with a spring 30, but you may pull and connect by weight using a wire or a pulley.
- (d) A spring 30 may not be arranged around the guide shaft 26, but you may arrange around the guide shaft 22.

[0026]

[Effect of the Invention] With substrate number-of-sheets detection equipment according to claim 1, since a substrate detection means is raised and the existence of a substrate can be detected after raising a guide means and carrying out the bracing of the substrate with a rise-and-fall means, without a substrate being deep and putting in a guide means, a substrate is deep and only a guide means can be put in.

[0027] With substrate number-of-sheets detection equipment according to claim 2, even if notches, such as an orientation flat, are formed in the substrate, one side of the guide means established one pair contacts the periphery section of a substrate, and can carry out the bracing of the substrate. with the substrate number-of-sheets detection equipment concerning claim 3, a slot is bigger than the thickness of a substrate -- since it is ***** (ing), a slot cannot contact a substrate easily.

[0028] With substrate number-of-sheets detection equipment according to claim 4, the existence of a substrate is detectable with a photosensor non-contact. With substrate number-of-sheets detection equipment according to claim 5, since a substrate detection means detects the existence of a substrate after a guide means carries out the bracing of the substrate, substrate number of sheets can be detected, without inserting a guide means in a substrate deeply.

[0029] With the substrate number-of-sheets detection equipment concerning claim 6, it can go up and down a guide means and a substrate detection means in one rise-and-fall actuator, and the configuration of a rise-and-fall means becomes simple.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The perspective view of the substrate processor with which one example of this invention was adopted.

[Drawing 2] The front view of substrate number-of-sheets detection equipment.

[Drawing 3] III-III of drawing 2 Sectional view.

[Drawing 4] A substrate guide and the flat-surface part drawing of a substrate detecting element.

[Drawing 5] A substrate guide and the side-face part drawing of a substrate detecting element.

[Drawing 6] The sectional view showing number-of-sheets detection actuation.

[Drawing 7] The sectional view showing number-of-sheets detection actuation.

[Description of Notations]

9 Substrate Number-of-Sheets Detection Equipment

15 Base Frame

16 Rise-and-Fall Frame

17 Detection Frame

21 Air Cylinder

31 32 Stopper

24 Substrate Guide

33 Substrate Detecting Element

[Translation done.]